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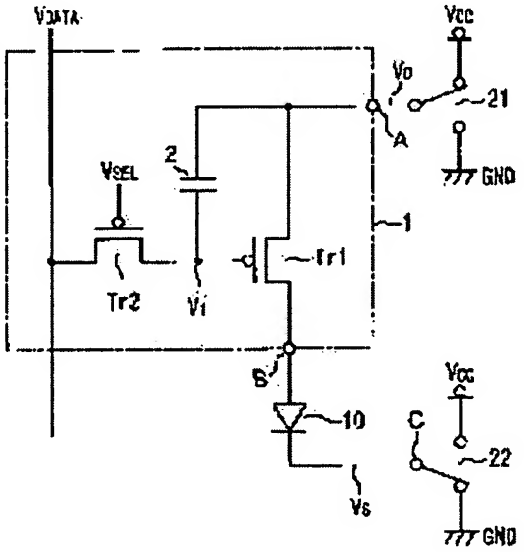
(54) DRIVING CIRCUIT FOR ACTIVE MATRIX DISPLAY AND ELECTRONIC APPARATUS AS WELL AS METHOD OF DRIVING ELECTRONIC DEVICE, AND ELECTRONIC DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To realize an organic electroluminescence element driving circuit which realizes reverse biasing with substantially no increase of the electric power consumption and the cost.
SOLUTION: The connecting relation between a power source potential VCC and GND is changed over by changing over switches 21 and 22. The reverse biasing to the organic electroluminescence element 10 is realized without freshly preparing an additional power source, such as a minus power source and the life of the organic electroluminescence element 10 is made longer.



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CLAIMS

[Claim(s)]
[Claim 1] It is the drive circuit where two or more pixels which consist of an electro-optics component carry out the active drive of the indicating equipment arranged in the shape of a matrix. The 1st terminal electrically connected to either of the 2nd power-source line which supplies the 2nd potential lower than the 1st power-source line and said 1st potential which supplies the 1st potential, Including the 2nd terminal electrically connected to either [said] the 1st and the 2nd [said] power-source line through said electro-optics component, when said electro-optics component is the 1st operating state Said 1st terminal is electrically connected to said 1st power-source line, and said 2nd terminal will be in the condition of having connected with said 2nd power-source line electrically through said electro-optics component. When said electro-optics component is the 2nd operating state It is the drive circuit of the active-matrix mold display with which said 1st terminal is electrically connected to said 2nd power-source line, and timing which will be in the condition that said 2nd terminal was electrically connected to said 1st power-source line through said electro-optics component is characterized by a certain thing at least.
[Claim 2] The drive transistor for controlling the operating state of said electro-optics component, The capacitative element which accumulates the charge for holding said drive transistor to an ON state, The charge control transistor which controls the charge to said capacitative element according to an external signal, Furthermore, contain, and while constitutes said capacitative element and an electrode is electrically connected to said 1st terminal. The electrode of another side which constitutes said capacitative element is electrically connected to the gate electrode of said drive transistor, and said the 1st terminal and said 2nd terminal are electrically connected through the source and the drain of said drive transistor, The drive circuit of the active-matrix mold display according to claim 1 by which it is characterized.
[Claim 3] The drive transistor for controlling the operating state of said electro-optics component, The capacitative element which accumulates the charge for holding said drive transistor to an ON state, The charge control transistor which controls the charge to said capacitative element according to an external signal, Furthermore, contain, and while constitutes said capacitative element and an electrode is electrically connected to said 1st terminal through the selection transistor turned off at the charge period of said capacitative element. The electrode of another side which constitutes said capacitative element is electrically connected to the gate electrode of said drive transistor. The drive circuit of the active-matrix mold display according to claim 1 characterized by connecting said the 1st terminal and said 2nd terminal to the source and the drain list of said drive transistor electrically through the source and the drain of said selection transistor.
[Claim 4] The drive transistor for controlling the operating state of said electro-optics component, The capacitative element which accumulates the charge for holding said drive transistor to an ON state, The charge control transistor which controls the charge to said capacitative element according to an external signal, Furthermore, contain, and while constitutes said capacitative element and an electrode is electrically connected to the gate electrode of said drive transistor.

The electrode of another side which constitutes said capacitative element is the drive circuit of the active-matrix mold display according to claim 1 characterized by connecting with a gland electrically and connecting said the 1st terminal and said 2nd terminal electrically through the source and the drain of said drive transistor.

[Claim 5] The drive circuit of the active-matrix mold display characterized by being the drive circuit of a active-matrix mold display according to claim 1 to 4, and said electro-optics component being an organic electroluminescent element.

[Claim 6] Electronic equipment by which it comes to mount a active-matrix mold display equipped with a drive circuit according to claim 1 to 5.

[Claim 7] The 1st power-source line which has the 1st potential, and the 2nd power-source line which has the 2nd potential which is low voltage from said 1st potential, The electronic device electrically arranged between said 1st power-source line and said 2nd power-source line, When it is the drive approach of preparation ********** and the end of said electronic device is electrically connected to said 1st power-source line It is the drive approach of the electronic instrument characterized by connecting said other end of said electronic device with said 1st power-source line electrically when connecting the other end of said electronic device to said 2nd power-source line and connecting said end of said electronic device to said 2nd power-source line electrically.

[Claim 8] It is the drive approach of the electronic instrument characterized by being the current driver element which drives said electronic device according to a current in the drive approach of an electronic instrument according to claim 7.

[Claim 9] The 1st power-source line which has the 1st potential, and the 2nd power-source line which has the 2nd potential which is low voltage from said 1st potential, When it is the electronic instrument equipped with the electronic device arranged electrically and the end of said electronic device is electrically connected to said 1st power-source line between said 1st power-source line and said 2nd power-source line It is the electronic instrument characterized by connecting said other end of said electronic device with said 1st power-source line electrically when the other end of said electronic device is connected to said 2nd power-source line and said end of said electronic device is electrically connected to said 2nd power-source line.

[Claim 10] It is the electronic instrument characterized by being arranged in the unit circuit arranged corresponding to the intersection of the data line with which said electronic device supplies a data signal in an electronic instrument according to claim 9, and the scanning line which supplies a scan signal.

[Claim 11] It is the electronic instrument characterized by including the 1st transistor by which said unit circuit controls the switch-on of said electronic device in an electronic instrument according to claim 10, the 2nd transistor by which the gate electrode was connected to said scanning line, and the capacitative element which accumulates the charge corresponding to said data signal which is connected to the gate electrode of said 1st transistor, and is supplied by said data line.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] About the drive approach of the drive circuit of the active-matrix mold display which used electro-optics components, such as an organic electroluminescence (Eectro Luminescense) component ("an organic electroluminescent element" is called hereafter), electronic equipment, and an electronic instrument, and an electronic instrument, this invention relates to the drive approach of a drive circuit with the function which carries out reverse bias impression to an electro-optics component, electronic equipment, and an electronic instrument, and an electronic instrument, in order to control especially degradation of an electro-optics component.
[0002]
[Description of the Prior Art] It is known by arranging two or more pixels which consist of an organic electroluminescent element which is one of the electro-optics components in the shape of a matrix that a display will be realizable. the cathode according [an organic electroluminescent element] to metal electrodes, such as Mg:Ag and AL:Li, and ITO (Indium Tin Oxide) from -- between the anode plates by the becoming transparent electrode, a configuration with the organic laminating thin film containing a luminous layer is taken.
[0003] The general configuration of the drive circuit of the active-matrix mold display using an organic electroluminescent element is shown in drawing 8 . In this drawing, the organic electroluminescent element is written as diode 10. Moreover, the drive circuit 1 consists of two transistors Tr1 and Tr2 which consist of thin film transistors (TFT), and a capacitative element 2 which accumulates a charge.
[0004] Both the transistors Tr1 and Tr2 shall be TFT(s) of a P channel mold. According to the charge accumulated in the capacitative element 2 in this drawing, on-off control of the transistor Tr1 is carried out. Charge to a capacitative element 2 is performed by data-line VDATA through the transistor Tr2 turned on by making selection potential VSEL into a low level. When a transistor Tr1 is ON, a current flows to the organic electroluminescent element 10 through a transistor Tr1. The organic electroluminescent element 10 emits light continuously by continuing passing this current to the organic electroluminescent element 10.
[0005] The easy timing chart about the circuit of drawing 8 is shown in drawing 9 . In performing data writing as shown in drawing 9 , a transistor Tr2 is made into an ON state by making selection potential VSEL into a low level, and this charges a capacitative element 2. This charge period is the write-in period TW in this drawing. The period which actually displays comes after this write-in period TW. In this period, a transistor Tr1 is turned on with the charge accumulated in the capacitative element 2. This period is the display period TH in this drawing.
[0006] Moreover, other configurations of the drive circuit of an organic electroluminescent element are shown in drawing 10 . The drive circuit shown in this drawing is indicated by reference "The Impact of Transient Response of Organic Light Organic Light Emitting Diodes on the Design of

Active Matrix OLED Displays" (1998 IEEE IEDM 98-875). As for Tr1, in drawing 10 , a drive transistor and Tr2 are 2nd selection transistor from which a charge control transistor and Tr3 turn the 1st selection transistor to the charge period of a capacitative element 2, and Tr4 is turned off.
[0007] Even if there is dispersion in a property also in a thing of the same specification, therefore it impresses the same electrical potential difference to the gate electrode of a transistor, the current of constant value does not necessarily flow to a transistor, and, as for a transistor, this may become factors, such as brightness unevenness, as here and it is known. On the other hand, in this drive circuit, a charge is accumulated in a capacitative element 2 based on the amount of currents according to the data signal outputted from a current source 4. Therefore, based on the amount of currents according to data, the luminescence condition of organic electroluminescence is controllable.
[0008] Transistors Tr1-Tr4 are P channel mold MOS transistors altogether, transistors Tr2 and Tr3 are made into an ON state by making selection potential VSEL into a low level, and the charge of a value according to the output of a current source 4 is accumulated in a capacitative element 2. And after the selection potential VSEL will become high-level and Tr2 and Tr3 will be in an OFF state, a current flows to the organic electroluminescent element 10 by a transistor Tr1 being in an ON state with the charge accumulated in this capacitative element 2, and a transistor Tr4 being turned on with the data-hold control signal Vgp.
[0009] The easy timing chart about the circuit of drawing 10 is shown in drawing 11 . In performing the data writing by the current source 4 as shown in drawing 11 , by making selection potential VSEL into a low level, transistors Tr2 and Tr3 are made into an ON state, and it charges a capacitative element 2. This charge period is the write-in period TW in this drawing. The period which actually displays comes after this write-in period TW. A transistor Tr1 is turned on by the data-hold control signal Vgp in the period of a low level, and this period turns into the display period TH.
[0010] Still more nearly another configuration of an organic electroluminescent element drive circuit is shown in drawing 12 . The drive circuit shown in this drawing is a circuit indicated by JP,11-272233,A. In this drawing, the drive circuit is constituted including the drive transistor Tr1 which gives the current by the power source to the organic electroluminescent element 10 when turned on, the capacitative element 2 which accumulates the charge for holding this transistor Tr1 to an ON state, and the charge control transistor Tr5 which controls the charge to a capacitative element 2 according to an external signal. In addition, when making the organic electroluminescent element 10 emit light, in order to make the charge control transistor Tr7 into an OFF state, potential Vrscan is held in the condition of a low level. Thereby, reset-signal Vrsig is not outputted. In addition, Tr6 is a transistor for adjustment.
[0011] In this drive circuit, when making the organic electroluminescent element 10 emit light, a transistor Tr5 is made into an ON state, and a capacitative element 2 is charged through a transistor Tr6 by data-line VDATA. What is necessary is to control the conductance between the source-drains of a transistor Tr1 according to this charge level, and just to pass a current to the organic electroluminescent element 10. That is, if potential Vscan is changed into a high-level condition in order to make a transistor Tr5 into an ON state as shown in drawing 13 , a capacitative element 2 will be charged through a transistor Tr6. According to this charge level, the conductance between the source-drains of a transistor Tr1 will be controlled, and a current will flow to the organic electroluminescent element 10.
[0012]
[Problem(s) to be Solved by the Invention] By the way, it is known that it is a means effective in the reinforcement of an organic electroluminescent element to impress a reverse bias to an organic electroluminescent element. This reinforcement is indicated by JP,11-8064,A, for example.
[0013] However, by the approach of this official report, when performing reverse bias impression to an organic electroluminescent element, additional power sources, such as a minus power source,

are newly prepared, and it is necessary to control to apply a reverse bias to an organic electroluminescent element.

[0014] Then, this invention aims at offering the drive approach of the drive circuit of the active-matrix mold display which can impress a reverse bias to electro-optics components, such as an organic electroluminescent element, without hardly being accompanied by the increment in power consumption or cost, electronic equipment, and an electronic instrument, and an electronic instrument.

[0015]

[Means for Solving the Problem] The drive circuit of the 1st active-matrix mold display by this invention It is the drive circuit where two or more pixels which consist of an electro-optics component carry out the active drive of the indicating equipment arranged in the shape of a matrix. The 1st terminal electrically connected to either of the 2nd power-source line which supplies the 2nd potential lower than the 1st power-source line and said 1st potential which supplies the 1st potential, Including the 2nd terminal electrically connected to either [said] the 1st and the 2nd [said] power-source line through said electro-optics component, when said electro-optics component is the 1st operating state Said 1st terminal is electrically connected to said 1st power-source line, and said 2nd terminal will be in the condition of having connected with said 2nd power-source line electrically through said electro-optics component. When said electro-optics component is the 2nd operating state, said 1st terminal is electrically connected to said 2nd power-source line, and timing which will be in the condition that said 2nd terminal was electrically connected to said 1st power-source line through said electro-optics component is characterized by a certain thing at least.

[0016] Moreover, the drive circuit of the 2nd active-matrix mold display by this invention The drive transistor for controlling the operating state of said electro-optics component, The capacitative element which accumulates the charge for holding said drive transistor to an ON state, The charge control transistor which controls the charge to said capacitative element according to an external signal, Furthermore, contain, and while constitutes said capacitative element and an electrode is electrically connected to said 1st terminal. It is characterized by connecting electrically to the gate electrode of said drive transistor the electrode of another side which constitutes said capacitative element, and connecting said the 1st terminal and said 2nd terminal electrically through the source and the drain of said drive transistor.

[0017] Moreover, the drive circuit of the 3rd active-matrix mold display by this invention The drive transistor for controlling the operating state of said electro-optics component, The capacitative element which accumulates the charge for holding said drive transistor to an ON state, The charge control transistor which controls the charge to said capacitative element according to an external signal, Furthermore, contain, and while constitutes said capacitative element and an electrode is electrically connected to said 1st terminal through the selection transistor turned off at the charge period of said capacitative element. The electrode of another side which constitutes said capacitative element is electrically connected to the gate electrode of said drive transistor. It is characterized by connecting said the 1st terminal and said 2nd terminal to the source and the drain list of said drive transistor electrically through the source and the drain of said selection transistor.

[0018] Moreover, the drive circuit of the 4th active-matrix mold display by this invention The drive transistor for controlling the operating state of said electro-optics component, The capacitative element which accumulates the charge for holding said drive transistor to an ON state, The charge control transistor which controls the charge to said capacitative element according to an external signal, Furthermore, contain, and while constitutes said capacitative element and an electrode is electrically connected to the gate electrode of said drive transistor. It is characterized by connecting electrically to a gland the electrode of another side which constitutes said capacitative element, and connecting said the 1st terminal and said 2nd terminal electrically through the source and the drain of said drive transistor.

[0019] In short, since the connection condition of the 1st power source and the 2nd power source over a drive circuit is switched with a switch, it is not necessary to add a power source and a reverse bias can be impressed to an organic electroluminescent element, without hardly being accompanied by the increment in power consumption or cost. In this case, generally, the 1st power source is VCC, the 2nd power source is a gland (GND), and the potential currently prepared from the first is used. But if sufficient potential difference for making an organic electroluminescent element emit light is securable, it will not be limited to them.
[0020] Moreover, the drive circuit of the 5th active-matrix mold display of this invention is characterized by said electro-optics component being an organic electroluminescent element.
[0021] Moreover, the 1st electronic equipment of this invention is characterized by being electronic equipment by which it comes to mount a active-matrix mold display equipped with said drive circuit.

[0022] Moreover, the 1st power-source line by which the drive approach of the 1st electronic instrument of this invention has the 1st potential, The 2nd power-source line which has the 2nd potential which is low voltage from said 1st potential, The electronic device electrically arranged between said 1st power-source line and said 2nd power-source line, When it is the drive approach of preparation ********** and said end of said electronic device is electrically connected to said 1st power-source line When connecting the other end of said electronic device to said 2nd power-source line and connecting said end of said electronic device to said 2nd power-source line electrically, it is characterized by connecting said other end of said electronic device with said 1st power-source line electrically.
[0023] In addition, it shall be contained also when other components, such as a transistor, are arranged not only between when the electronic device is not necessarily connected ["it is arranged electrically" and] to the DC power supply line, but a power-source line and an electronic device. Moreover, as an electronic device, it is a liquid crystal device, an electrophoresis component, an electroluminescent element, etc., and the component which drives an electrical potential difference by supplying impression or a current is meant, for example.
[0024] Moreover, the drive approach of the 2nd electronic instrument of this invention is characterized by said electronic device being a current driver element driven according to a current in the drive approach of the above-mentioned electronic instrument.
[0025] That is, when an electronic device is a current driver element, to an electronic device, the current of the forward direction and hard flow will flow by this drive approach.
[0026] Moreover, the 1st power-source line by which the 1st electronic instrument of this invention has the 1st potential, The 2nd power-source line which has the 2nd potential which is low voltage from said 1st potential, When it is the electronic instrument equipped with the electronic device arranged electrically and the end of said electronic device is electrically connected to said 1st power-source line between said 1st power-source line and said 2nd power-source line When the other end of said electronic device is connected to said 2nd power-source line and said end of said electronic device is electrically connected to said 2nd power-source line, said other end of said electronic device is characterized by connecting with said 1st power-source line electrically.
[0027] Moreover, the 2nd electronic instrument of this invention is characterized by arranging said electronic device in the unit circuit arranged corresponding to the intersection of the data line which supplies a data signal, and the scanning line which supplies a scan signal in the above-mentioned electronic instrument.
[0028] Moreover, the 3rd electronic instrument of this invention is characterized by said unit circuit containing the 1st transistor which controls the switch-on of said electronic device, the 2nd transistor by which the gate electrode was connected to said scanning line, and the capacitative element which accumulates the charge corresponding to said data signal which is connected to the gate electrode of said 1st transistor, and is supplied by said data line in the above-mentioned electronic instrument.

[0029]
[Embodiment of the Invention] Next, the gestalt of operation of this invention is explained with reference to a drawing. In addition, other drawings and equivalent parts are shown by the same sign in each drawing referred to in the following explanation.
[0030] Drawing 1 is the block diagram showing the drive circuit of the active-matrix mold indicating equipment using the organic electroluminescent element by this invention. The organic electroluminescent element drive circuit 1 of this example has the 1st terminal A as shown in this drawing. With a switch 21, the 1st terminal A has become either the 1st power-source line which supplies the 1st potential (VCC), and the 2nd power-source line which supplies the 2nd potential (GND) lower than the 1st potential with the connectable configuration electrically.
[0031] Moreover, the organic electroluminescent element drive circuit 1 has the 2nd terminal B. The 2nd terminal B is electrically connected with the switch 22 through the organic electroluminescent element 10. The 2nd terminal B has connectable composition electrically through the organic electroluminescent element 10 with a switch 22 at either the 1st power-source line which supplies the 1st potential (VCC), and the 2nd power-source line which supplies the 2nd potential (GND) lower than the 1st potential. In addition, the 1st potential (VCC) is potential higher than the 2nd potential (GND), for example, is about 10V.
[0032] What is necessary is to set a switch 21 to the 1st power-source line side which supplies the 1st potential (VCC), and just to set a switch 22 to the 2nd power-source line side which supplies the 2nd potential (GND), when making the organic electroluminescent element 10 emit light (i.e., when performing a display) (the 1st operating state). At this time, the 1st terminal A is electrically connected with the 1st power-source line, and the 2nd terminal B is electrically connected with the 2nd power-source line through the organic electroluminescent element 10.
[0033] What is necessary is on the other hand, to set a switch 21 to the 2nd power-source line side which supplies the 2nd potential (GND), and just to set a switch 22 to the 1st power-source line side which supplies the 1st potential (VCC), when not making the organic electroluminescent element 10 emit light (i.e., when not performing a display) (the 2nd operating state). At this time, the 1st terminal A is electrically connected with the 2nd power-source line, and the 2nd terminal B is electrically connected with the 1st power-source line through the organic electroluminescent element 10. Since the potential of Terminal B does not become larger than the 1st potential (VCC) such at the time of electrical installation-related, a reverse bias will be impressed to the organic electroluminescent element 10. However, there is no need that an organic electroluminescent element continues the above electrical installation relation during the whole term which is the 2nd operating state. What is necessary is just to be able to keep the above electrical installation relation a part in a period at least, inside an organic electroluminescent element is a period in the 2nd operating state.
[0034] Thus, a setup of switches 21 and 22 is only switched, and the reverse bias can be impressed to the organic electroluminescent element. And since it is not necessary to newly prepare additional power sources, such as a minus power source, in order to use the power source and GND which are prepared from the first in this case, power consumption does not increase or the increment in cost is not caused. In addition, these switches 21 and 22 are easily realizable combining a transistor.
[0035]
[Example] Drawing 2 is the block diagram showing the internal configuration of the drive circuit by the 1st example. The circuitry of drawing 8 mentioned above is made into the drive circuit 1 in this drawing. That is, the drive circuit 1 is constituted including the drive transistor Tr1 for controlling the operating state of the organic electroluminescent element 10, the capacitative element 2 which accumulates the charge for holding this transistor Tr1 to an ON state, and the charge control transistor Tr2 which controls the charge to a capacitative element 2 according to an external signal. And in the drive circuit 1, the electrode of another side where an electrode is electrically connected to the 1st terminal A, and while a capacitative element 2 is constituted constitutes a capacitative

element 2 is electrically connected to the gate electrode of the drive transistor Tr1. Furthermore, the source or the drain of another side with which the source or a drain is electrically connected to the 1st terminal A, and while the drive transistor Tr1 is constituted constitutes the drive transistor Tr1 is electrically connected to the 2nd terminal B. For this reason, the 1st terminal A and the 2nd terminal B will be electrically connected through the source and the drain of the drive transistor Tr1.

[0036] And the electrical installation condition of the 1st terminal A and the 2nd terminal B is switched with switches 21 and 22. That is, in making the organic electroluminescent element 10 emit light (the 1st operating state), a switch 21 is set to the power-source potential VCC side, and it sets a switch 22 to the GND side. What is necessary is to charge a capacitative element 2 in this condition, to make a transistor Tr1 into an ON state, and just to pass a current to the organic electroluminescent element 10.

[0037] What is necessary is on the other hand, to set a switch 21 to the GND side and just to set a switch 22 to the power-source potential VCC side, in not making the organic electroluminescent element 10 emit light (the 2nd operating state). In this case, the selection potential VSEL is maintained at the power-source potential VCC as shown in drawing 3 . The potential (VD) of the 1st terminal A is reduced to GND from the power-source potential VCC, and the potential (VS) of the 3rd terminal C is raised from GND to the power-source potential VCC after this fall. Then, the gate potential V1 of the drive transistor Tr1 follows and falls to change of potential VD. Usually, although wiring capacity (not shown) is added to the gate line of a transistor Tr1, when the magnitude of the capacity was extent which can be disregarded to the capacity of a capacitative element 2 and the potential VD of the 1st terminal A changes from the power-source potential VCC to GND, the gate potential V1 of a transistor Tr1 falls by the power-source potential VCC. Since the potential of the 2nd terminal B is the threshold electrical potential difference (Vth) of the drive transistor Tr1 at the maximum and the potential VS of the 3rd terminal C turns into the power-source potential VCC at this time, a reverse bias will be impressed to the organic electroluminescent element 10.

[0038] Thus, a reverse bias can be impressed to an organic electroluminescent element only by switching a setup of switches 21 and 22. And since it is not necessary to newly prepare additional power sources, such as a minus power source, power consumption does not increase or cost does not increase sharply.

[0039] Drawing 4 is the block diagram showing the internal configuration of the drive circuit by the 2nd example. The circuitry of drawing 10 mentioned above is made into the drive circuit 1 in this drawing. That is, the drive circuit 1 is constituted including the drive transistor Tr1 for controlling the operating state of the organic electroluminescent element 10, the capacitative element 2 which accumulates the charge for controlling the switch-on of this transistor Tr1, and the charge control transistor Tr2 which controls the charge to a capacitative element 2 according to an external signal. And an electrode is electrically connected to the 1st terminal A through the 2nd selection transistor Tr4, and the electrode of another side which constitutes a capacitative element 2 is electrically connected [in / a capacitative element 2 is constituted / the drive circuit 1] to the gate electrode of the drive transistor Tr1. Furthermore, the end of the drive transistor Tr1 is electrically connected to the 1st terminal A through the 2nd selection transistor Tr4, and the other end of the drive transistor Tr1 is electrically connected to the 2nd terminal B. For this reason, the 1st terminal A and the 2nd terminal B will be electrically connected through the source and the drain of the drive transistor Tr1 and the selection transistor Tr4.

[0040] Even if there is dispersion in a property also in a thing of the same specification, therefore it impresses the same electrical potential difference to the gate electrode of a transistor, the current of constant value does not necessarily flow to a transistor, and, as for a transistor, this may become factors, such as brightness unevenness, as here and it is known. On the other hand, in this drive circuit, a charge is accumulated in a capacitative element 2 based on the amount of currents according to the data signal outputted from a current source 4. Therefore, based on the amount of

currents according to data, the luminescence condition of organic electroluminescence is controllable.

[0041] In this drive circuit, the electrical installation condition of the 1st terminal A and the 2nd terminal B is switched to the power-source potentials VCC and GND by switches 21 and 22. Namely, what is necessary is to set a switch 21 to the power-source potential VCC side, to set a switch 22 to the GND side, to make a transistor Tr4 into an ON state, while making a transistor Tr1 into an ON state further, and just to pass a current to the organic electroluminescent element 10, in making the organic electroluminescent element 10 emit light.

[0042] What is necessary is on the other hand, to set a switch 21 to the GND side and just to set a switch 22 to the power-source potential VCC side, in impressing a reverse bias to the organic electroluminescent element 10. In this case, as shown in drawing 5 , the selection potential VSEL is maintained at the power-source potential VCC, and the data-hold control signal Vgp is maintained at GND. And the potential VD of the 1st terminal A is reduced to GND from the power-source potential VCC. After this fall, the potential VS of the 3rd terminal C is raised from GND to the power-source potential VCC. In addition, only the actuation after the current writing in this drive circuit is shown in drawing 5 .

[0043] Since a transistor Tr4 is always an ON state, the potential V1 of Node D follows that the potential VD of the 1st terminal A fell to GND from the power-source potential VCC, and falls to the threshold electrical potential difference Vth of a transistor Tr4 from the power-source potential VCC. At this time, if it is usual, wiring capacity (not shown) will be added to the gate line of a transistor Tr1, but if the magnitude of that capacity is extent which can be disregarded to the capacity of a capacitative element 2, the potential V2 of Node E will change with V2- (VCC-Vth). Furthermore, in potential V2 <=VCC-Vth, the potential potential V3 of the 2nd terminal B falls to the threshold electrical potential difference Vth. In addition, the threshold electrical potential difference of transistors Tr1 and Tr4 is premised on the equal thing for the above publication. Thus, a reverse bias will be impressed to the organic electroluminescent element 10.

[0044] Thus, impression of the reverse bias to an organic electroluminescent element is realizable only by switching a setup of a switch. And since it is not necessary to newly prepare additional power sources, such as a minus power source, power consumption does not increase or cost does not increase sharply.

[0045] Drawing 6 is the block diagram showing the internal configuration of the drive circuit by the 3rd example. The circuit indicated by JP,11-272233,A is made into the drive circuit 1 in this drawing. That is, the drive circuit 1 is constituted including the drive transistor Tr1 for controlling the operating state of the organic electroluminescent element 10, the capacitative element 2 which accumulates the charge for holding this transistor Tr1 to an ON state, and the charge control transistor Tr5 which controls the are recording condition of the charge of a capacitative element 2 according to an external signal. And in the drive circuit 1, the electrode of another side where an electrode is electrically connected to the gate electrode of the drive transistor Tr1, and while a capacitative element 2 is constituted constitutes a capacitative element 2 is electrically connected to GND. Furthermore, the source or the drain of another side with which the source or a drain is electrically connected to the 1st terminal A, and while the drive transistor Tr1 is constituted constitutes the drive transistor Tr1 is electrically connected to the 2nd terminal B. For this reason, the 1st terminal A and the 2nd terminal B will be electrically connected through the source and the drain of the drive transistor Tr1. In addition, the transistors Tr1 and Tr6 in this drawing are P channel mold transistors, and transistors Tr5 and Tr7 are N channel mold transistors. Moreover, the transistor Tr6 by which diode connection was made is effective in compensating dispersion in the threshold of a transistor Tr1.

[0046] In this drive circuit, the electrical installation condition of the 1st terminal A and the 2nd terminal B is switched to the power-source potentials VCC and GND by switches 21 and 22. That is, in making the organic electroluminescent element 10 emit light, a switch 21 is set to the power-

source potential VCC side, and it sets a switch 22 to the GND side. A transistor Tr5 is made into an ON state in this condition, and a capacitative element 2 is charged through a transistor Tr6. What is necessary is to control the conductance between the source-drains of a transistor Tr1 according to this charge level, and just to pass a current to the organic electroluminescent element 10.
[0047] What is necessary is on the other hand, to set a switch 21 to the GND side and just to set a switch 22 to the power-source potential VCC side, in impressing a reverse bias to the organic electroluminescent element 10. In this case, potential Vscan first impressed to the gate electrode of the charge control transistor Tr5 is made into the power-source potential VCC, and a capacitative element 2 is charged as shown in drawing 7 . At this time, only the period which makes enough charges for making a transistor Tr1 turn on hold to a capacitative element 2 (it charges) is made into the power-source potential VCC. Data-line VDATA needs to have potential which a transistor Tr1 turns on. After this charge, a switch 21 is switched, the potential VD of the 1st terminal A is reduced to GND from VCC, a switch 22 is switched further after that, and the potential VS of the 3rd terminal C is raised from GND to VCC. In addition, Tr7 is a transistor for reset, and when having applied the reverse bias to the organic electroluminescent element 10, in order to make this transistor Tr7 into an OFF state, it holds potential Vrscan to GND.
[0048] Thus, a reverse bias can be impressed to an organic electroluminescent element only by switching a setup of a switch. And since it is not necessary to newly prepare additional power sources, such as a minus power source, power consumption does not increase or cost does not increase sharply.
[0049] In addition, in each above example, although timing was shifted and two switches 21 and 22 are switched, it is clear that these switches may be switched to coincidence. If timing is shifted and the control signal for carrying out change control is inputted into two switches, two switches can be switched to different timing. In this case, what is necessary is just to input the control signal of each of two switches through the buffer of a different number of stages.
[0050] By the way, although the drive circuit of the active-matrix mold display which used the organic electroluminescent element was explained above, the applicability of this invention is not restricted to this, for example, can be applied also to the active-matrix mold display using electro-optics components other than organic electroluminescent elements, such as TFT-LCD, FED (Field Emission Display), an electrophoresis component and an electric-field reversal component, laser diode, and LED.
[0051] Some examples of the electronic equipment which applied the active-matrix mold display constituted by next having the drive circuit 1 explained above are explained. Drawing 14 is the perspective view showing the configuration of the personal computer of the mobile mold which applied this active-matrix mold indicating equipment. In this drawing, the personal computer 1100 was constituted by the body section 1104 equipped with the keyboard 1102, and the display unit 1106, and this display unit 1106 is equipped with said active-matrix mold display 100.
[0052] Moreover, drawing 15 is the perspective view showing the configuration of the portable telephone which applied the active-matrix mold display 100 constituted by having the above-mentioned drive circuit to the display. In this drawing, the portable telephone 1200 is equipped with the aforementioned active-matrix mold display 100 with the ear piece 1204 besides two or more manual operation buttons 1202, and the speaker 1206.
[0053] Moreover, drawing 16 is the perspective view showing the configuration of the digital still camera which applied the active-matrix mold indicating equipment 100 constituted by having the above-mentioned drive circuit to the finder. In addition, it is shown in this drawing in [connection / with an external instrument] simple. To the here usual camera exposing a film according to the light figure of a photographic subject, the digital still camera 1300 carries out photo electric conversion of the light figure of a photographic subject with image sensors, such as CCD (Charge Coupled Device), and generates an image pick-up signal. The active-matrix mold display 100 is formed, it has composition which displays based on the image pick-up signal by CCD, and the active-matrix mold

display 100 functions on the tooth back of the case 1302 in the digital still camera 1300 as a finder which displays a photographic subject. Moreover, the light-receiving unit 1304 containing an optical lens, CCD, etc. is formed in the case 1302 observation-side (setting to drawing rear-face side).
[0054] When a photography person checks the photographic subject image displayed on the drive circuit and does the depression of the shutter carbon button 1306, the image pick-up signal of CCD at the time is transmitted and stored at the memory of the circuit board 1308. Moreover, if it is in this digital still camera 1300, the video signal output terminal 1312 and the input/output terminal 1314 for data communication are formed in the side face of a case 1302. And as shown in drawing, a personal computer 1430 is connected to the input/output terminal 1314 for the latter data communication for a television monitor 1430 again at the former video signal output terminal 1312 if needed, respectively. Furthermore, the image pick-up signal stored in the memory of the circuit board 1308 by predetermined actuation has a television monitor 1430 and composition outputted to a personal computer 1440.
[0055] In addition, as electronic equipment by which the active-matrix mold display 100 of this invention is applied, ****** equipped with the video tape recorder of a liquid crystal television, and a viewfinder mold and a monitor direct viewing type, the car navigation equipment, the pager, the electronic notebook, the calculator, the word processor, the workstation, the TV phone, POS terminal, and touch panel other than the personal computer of drawing 14 , the cellular phone of drawing 15 , and the digital still camera of drawing 16 etc. is mentioned. And it cannot be overemphasized that the active-matrix mold display 100 mentioned above can be applied as a display of these various electronic equipment.
[0056]
[Effect of the Invention] As explained above, by switching with a switch the connection condition of the 1st power source which consists of the 1st potential, and the 2nd power source which consists of the 2nd potential, this invention does not newly need to prepare additional power sources, such as a minus power source, and is effective in the ability to realize reverse bias impression, without hardly being accompanied by the increment in power consumption, or increase of cost.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing one gestalt of operation of the organic electroluminescent element drive circuit by this invention.
[Drawing 2] It is the block diagram showing the 1st example of the organic electroluminescent element drive circuit by this invention.
[Drawing 3] It is the wave form chart showing actuation of the organic electroluminescent element drive circuit of drawing 2 .
[Drawing 4] It is the block diagram showing the 2nd example of the organic electroluminescent element drive circuit by this invention.
[Drawing 5] It is the wave form chart showing actuation of the circuit of drawing 4 .
[Drawing 6] It is the block diagram showing the 3rd example of the organic electroluminescent element drive circuit by this invention.
[Drawing 7] It is the wave form chart showing actuation of the circuit of drawing 6 .
[Drawing 8] It is the block diagram showing the example of a configuration of the conventional organic electroluminescent element drive circuit.
[Drawing 9] It is the wave form chart showing actuation of the circuit of drawing 8 .
[Drawing 10] It is the block diagram showing other examples of a configuration of the conventional organic electroluminescent element drive circuit.
[Drawing 11] It is the wave form chart showing actuation of the circuit of drawing 10 .
[Drawing 12] It is the block diagram showing other examples of a configuration of the conventional organic electroluminescent element drive circuit.
[Drawing 13] It is the wave form chart showing actuation of the circuit of drawing 12 .
[Drawing 14] It is drawing showing an example at the time of applying the active-matrix mold indicating equipment equipped with the drive circuit by one example of this invention to the personal computer of a mobile mold.
[Drawing 15] It is drawing showing an example at the time of applying the active-matrix mold display equipped with the drive circuit by one example of this invention to the display of a portable telephone.
[Drawing 16] It is drawing showing the perspective view of the digital still camera which applied the active-matrix mold indicating equipment equipped with the drive circuit by one example of this invention to the finder part.
[Description of Notations]
1 Drive Circuit
2 Capacitative Element
4 Current Source
10 Organic Electroluminescent Element
21 22 Switch

Tr1-Tr7 Transistor

[Translation done.]

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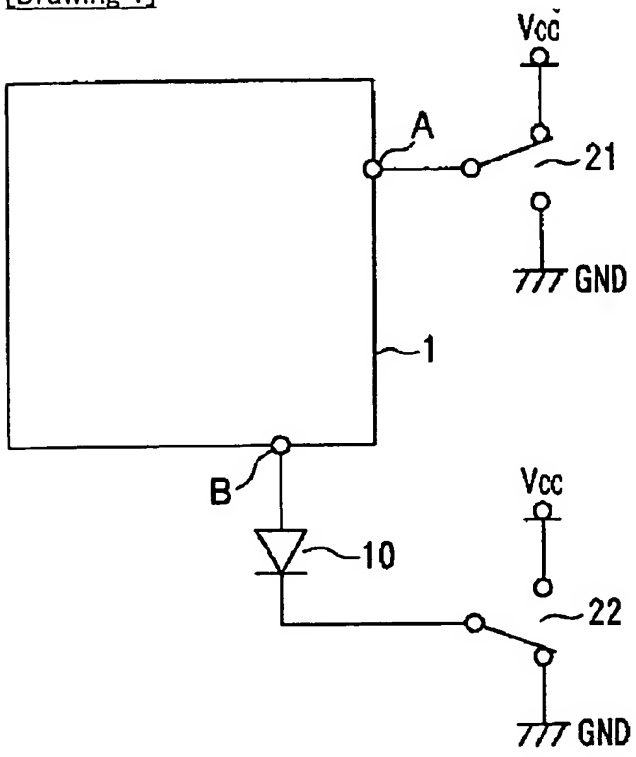
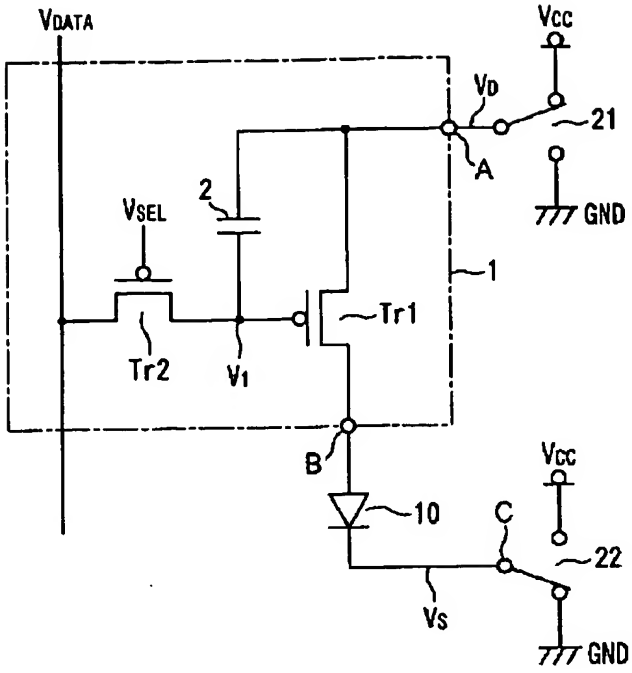
DRAWINGS

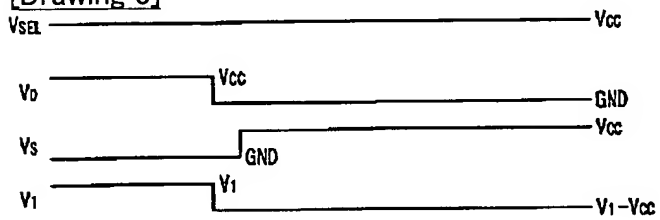
[Drawing 1]



[Drawing 2]



[Drawing 3]



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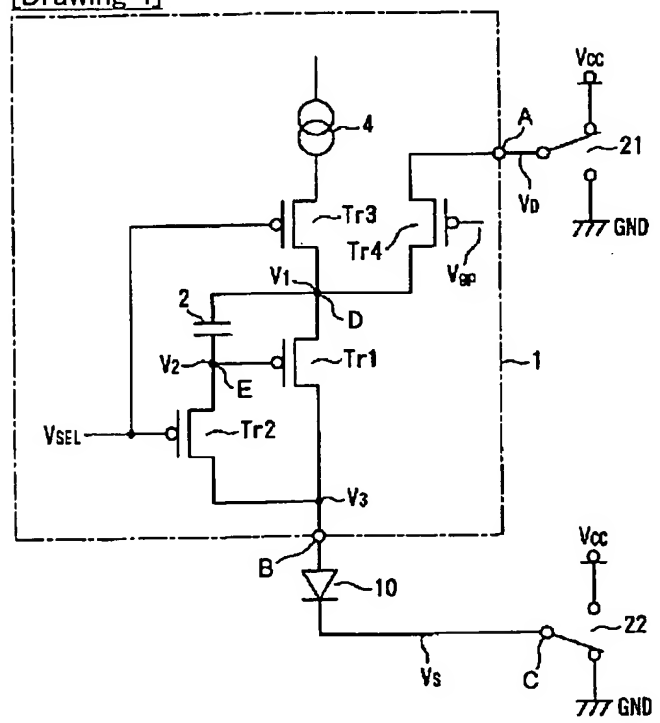
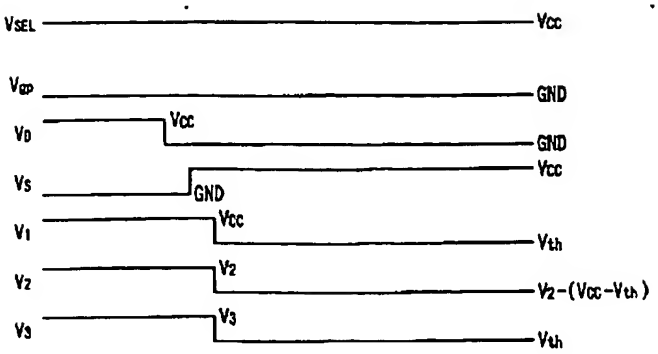
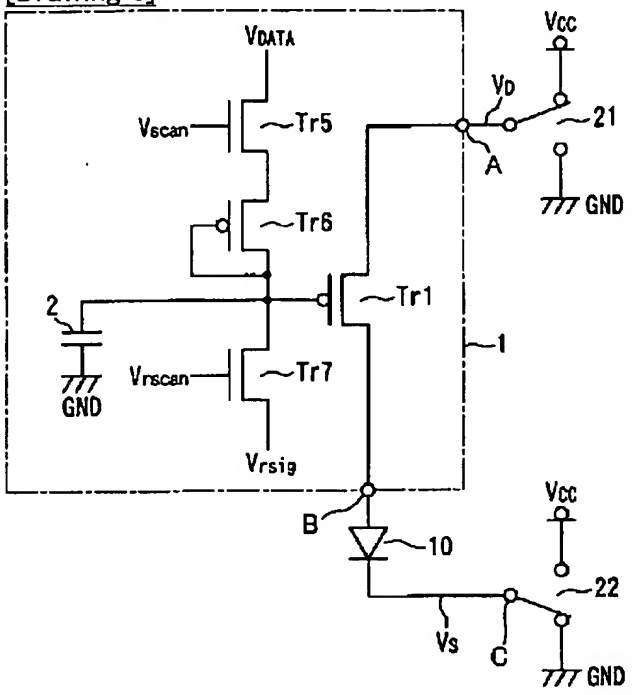


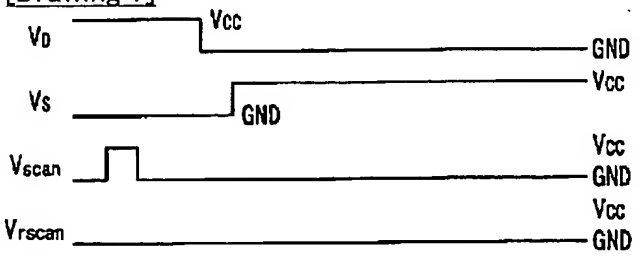
[Drawing 5]



[Drawing 6]



[Drawing 7]



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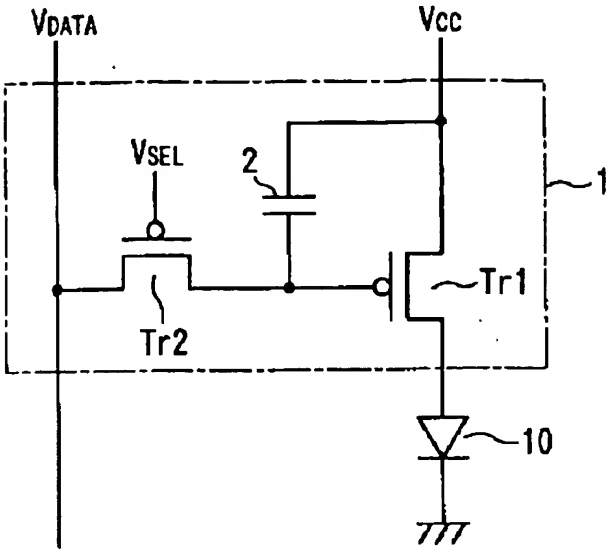

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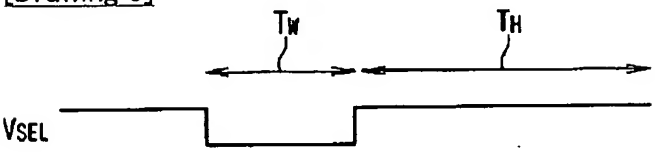
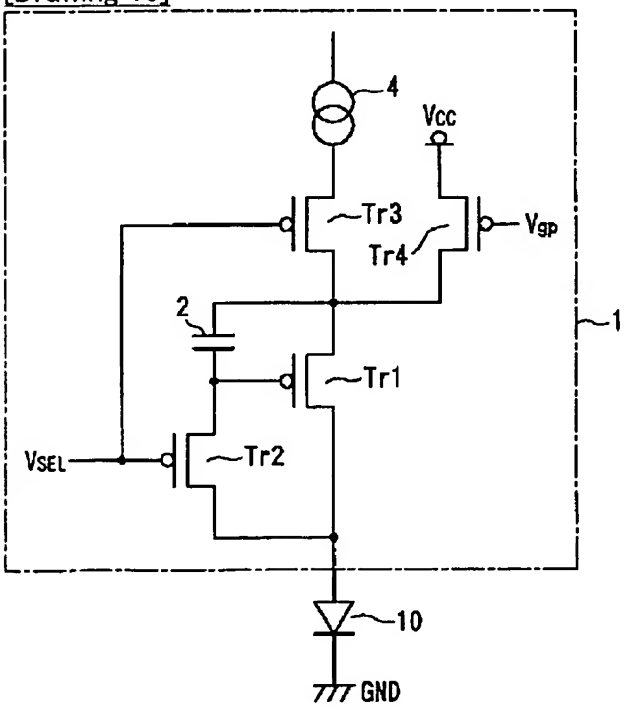


[Drawing 10]



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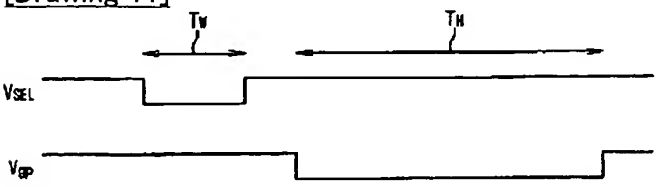

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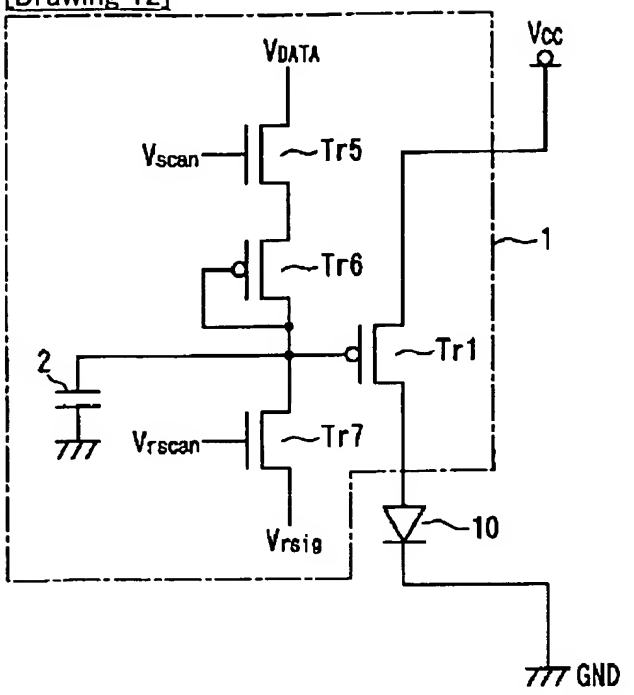
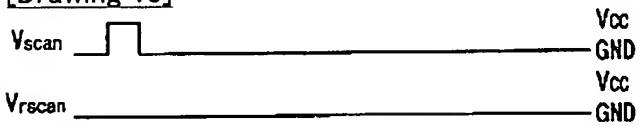
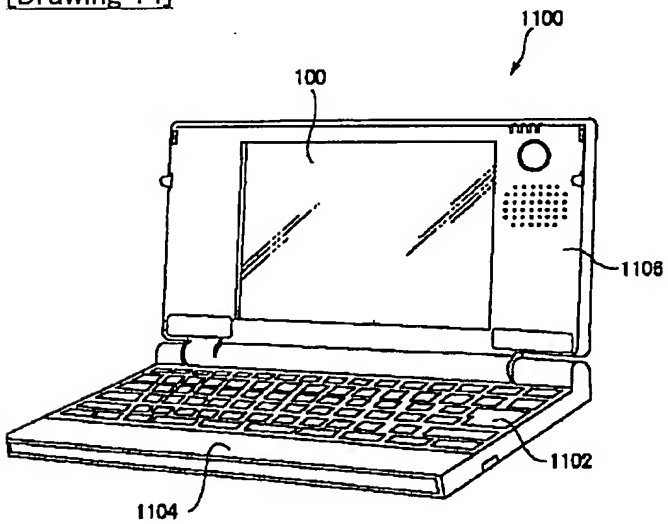


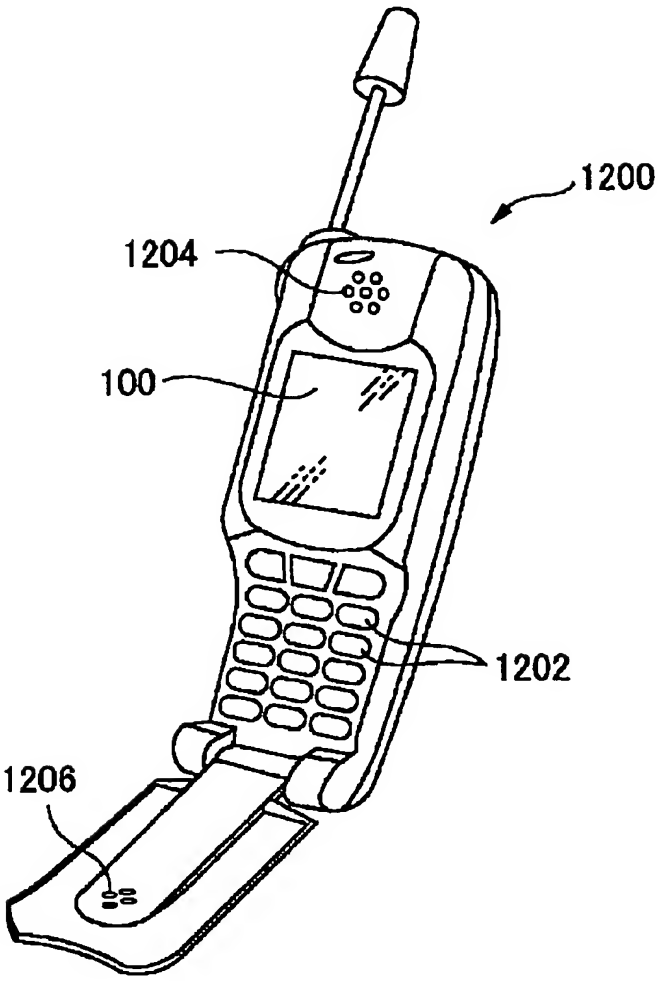
[Drawing 13]



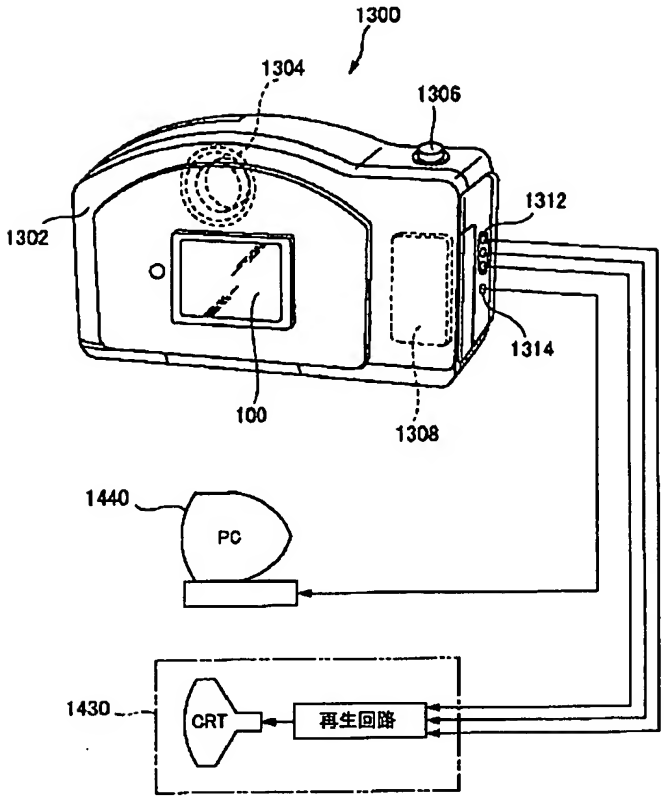
[Drawing 14]



[Drawing 15]



[Drawing 16]



[Translation done.]